

REMARKS

Claims 1-8 and 12-17 were rejected in the Office Action dated November 9, 2004. Claims 9-11 were objected to as being dependant upon a rejected base claim, but would be otherwise allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim.

Applicant amends claims 1, 9, 10, 14, 15, and 17. Applicant cancels claims 4, and 11-13, without prejudice, and adds new claims 18-19. Therefore claims 1-3, 5-10, and 14-19 are pending in the application and are submitted for further examination and allowance.

Discussion of Objections to the Claims

The Examiner objected to claims 1 and 17 for informalities relating to antecedent basis of terms appearing in the body of the claim. Applicant has amended claims 1 and 17 in the manner suggested by the Examiner to correct the claim terms identified by the Examiner. Therefore, Applicant respectfully requests withdrawal of the objections to claims 1 and 17.

Discussion of Rejections Under 35 USC §102(e)

The Examiner has rejected claims 1-5 and 14-16 under 35 USC §102(e) as allegedly anticipated by U.S. Patent No. 6,385,439 to Hellberg (hereinafter Hellberg). The Examiner alleges that all claim limitations are taught or suggested by Hellberg.

Applicant, by this paper, cancels claim 4 without prejudice. Therefore, the rejection to claim 4 is moot in light of the cancellation. Applicant respectfully traverses the rejection and requests reconsideration and withdrawal of the rejection based on Hellberg.

In order for a claim to be anticipated by a reference, each and every element as set forth in the claim, either expressly or inherently described, in the single prior art reference. Applicant respectfully contends that Hellberg fails to disclose at least one claimed element from each of claims 1-3, 5, and 14-16.

Claim 1 requires "generating an interleaved baseband signal by selectively interchanging a routing of a plurality of baseband signals according to an interleaver operation" and "mixing the interleaved baseband signal with a plurality of oscillator signals with different phases in an interleaving manner, the interleaving manner related to the interleaver operation." Figure 3 in conjunction with Figures 4a-4d and 5a-5d of the application, as filed, illustrate the

operation of these elements of the claimed method. Hellberg fails to describe, either expressly or inherently, either of these claimed elements.

In particular, Hellberg fails to describe generating an interleaved baseband signal by selectively interchanging a routing of a plurality of baseband signals. Figure 2 of Hellberg shows, and the accompanying text describes, single-ended in-phase (I) and quadrature (Q) baseband signals passing through a power amplifier stage that generates differential I and Q baseband signals. Hellberg states: "The first and second power amplifiers 30 and 32 are well known single-ended-to-double-ended amplifiers that amplify a single-ended input signal to produce a pair of complementary output signals, which are 180° out of phase from each other." *Hellberg*, Col. 3 ll. 57-61. The differential I and Q baseband signals are directly routed to the up-converting mixer (reference item 18 in Figure 2 of Hellberg). Hellberg provides no illustration, nor discussion of any interleaved baseband signal that is generated according to an interleaver operation.

In contrast, Applicant's application, as filed, provides an example of the claimed baseband interleaver operation shown in Figure 4a-4d of Applicant's application. As can be seen from the figures, and as are described in the accompanying text, the routing of the plurality of baseband signals are selectively interchanged based on the interleaver operation. For example, the I and Q baseband signals are routed through a straight signal path in Figure 4a, and are cross routed in Figure 4c.

Additionally, Hellberg does not describe "mixing the interleaved baseband signal with a plurality of oscillator signals with different phases in an interleaving manner." The Examiner contends that the interleaving of the oscillator signals is described in Hellberg, at Col. 5 line 65 through Col. 6, line 1.

Applicant contends that the description cited by the Examiner and the corresponding Figure 5 from Hellberg only shows multiple phases of a local oscillator routed to different signal paths and does not show any interleaving of the oscillator signals. In contrast to the claimed feature, Figures 2 and 5 of Hellberg show that the oscillator signals are always routed to the same location within the up-converting mixer. In Hellberg Figure 2, the first LO output is always routed to the first switch, the second LO output is always routed to the second switch, and so on. There is no interleaving of the LO outputs.

Therefore, Applicant respectfully request reconsideration and allowance of claim 1, because Hellberg fails to describe, either expressly or inherently, all of the elements of the claim.

Claim 15-16 also require "mixing a baseband signal with a plurality of oscillator signals with different phases in an interleaving manner" and are believed to be allowable for some of the same reasons provided above in relation to claim 1. In particular, Hellberg fails to disclose interleaving the plurality of oscillator signals with different phases. Applicant respectfully requests reconsideration and allowance of claims 15-16.

Claims 2-3, 5, and 14-15 depend, either directly or indirectly from claim 1 and are believed to be allowable at least for the reason that they depend from an allowable base claim. Applicant respectfully requests reconsideration and allowance of claims 2-3, 5, and 14-15.

Discussion of Rejections Under 35 USC §103(a)

Claims 6-8 are rejected under 35 USC §103(a) as allegedly unpatentable over Hellberg in view of U.S. Patent No. 6,016,422 to Bartusiak (hereinafter Bartusiak). Claim 12 is rejected as allegedly unpatentable over Hellberg in view of U.S. Patent No. 6,064,664 to Kim (hereinafter Kim). Claim 13 is rejected as allegedly unpatentable over Hellberg in view of U.S. Patent No. 6,055,429 to Lynch (hereinafter Lynch), and Claim 17 is rejected as allegedly unpatentable over Hellberg in view of U.S. Patent No. 6,385,439 to Takikawa et al. (hereinafter Takikawa). The Examiners contend the combination of references teach or suggest all of the claim limitations of the corresponding claims.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be reasonable expectation of success. Finally, the prior art reference, or references when combined, must teach or suggest all of the claim limitations.

Applicant cancels claims 12-13 without prejudice. Thus, the rejections to those claims are moot in light of the claim cancellation. Applicant respectfully traverses the rejection to the remaining claims and requests reconsideration and allowance of claims 6-8 and 17, because the cited references fail to teach or suggest all of the claim limitations.

As discussed above, Hellberg fails to disclose each and every limitation of claim 1. With respect to claims 6-8, Bartusiak fails to describe those features of claim 1 lacking in Hellberg. Similarly, with respect to claim 17, Takikawa fails to disclose the limitations of claim 1 that are lacking in Hellberg.

As discussed above, claim 1 requires "generating an interleaved baseband signal by selectively interchanging a routing of a plurality of baseband signals according to an interleaver operation" and "mixing the interleaved baseband signal with a plurality of oscillator signals with different phases in an interleaving manner, the interleaving manner related to the interleaver operation." Bartusiak fails to describe either of these claim 1 features. Bartusiak shows, in Figure 3, a direct conversion transceiver. The transmitter portion of the direct conversion transceiver includes I and Q baseband signals that are coupled to respective I and Q mixers. Bartusiak states: "The first and second differential modulated signals are coupled to first inputs of mixer circuits 358 and 360, respectively. Mixer circuits 358 and 360 are sometimes referred to as the transmit 'I' and 'Q' mixers, respectively." *Bartusiak*, Col. 7 ll. 47-50. Bartusiak does not describe or even suggest that the baseband signals have selectively interchanging routing.

Similarly, the LO signals shown in the transceiver of Figure 3 of Bartusiak are not provided to the mixer in an interleaving manner. Instead, the in-phase LO signal is routed exclusively to the I mixer and the quadrature LO signal is routed exclusively to the Q mixer. *See, Bartusiak*, at Col. 7 line 63 through Col. 8 line 14. Thus, Bartusiak does not describe mixing with "a plurality of oscillator signals with different phases in an interleaving manner."

Hellberg in combination with Bartusiak fail to teach or suggest all of the claim limitations. Therefore, Applicant believes claim 1 to be allowable over the combination of Hellberg with Bartusiak. Claims 6-8 depend from claim 1 and are believed to be allowable at least for the reason that they depend from an allowable base claim.

Similarly, Claim 17 requires "at least one mixer for mixing a baseband signal with a plurality of oscillator signals with different phases in an interleaving manner." As described above, Hellberg does not disclose mixing a baseband signal with a plurality of oscillator signals with different phases in an interleaving manner. Takikawa fails to disclose this feature of claim 17. Takikawa, in Figures 5 and 9, shows only direct connections between the oscillator 18 and

the mixers, in block 11. Therefore, Takikawa does not disclose any interleaving of a plurality of oscillator signals and does not describe mixing a baseband signal with a plurality of oscillator signals with different phases in an interleaving manner. Applicant respectfully requests reconsideration and allowance of claim 17 because Hellberg in combination with Takikawa fails to teach or suggest all of the claim limitations.

The Examiner cites Kim and Lynch references as describing interleavers. However, the interleavers described in Kim and Lynch are not the type of interleavers that are described in Applicant's claims. As stated in Applicant's specification: "In the context of the present description, 'interleaving' may refer to the plain and ordinary meaning thereof, as well as any sort of switching, exchanging, toggling, swapping, interchanging, etc." Thus, in claim 1, and 15-17, interleaving of oscillator signals refers to switching, exchanging, swapping, or interchanging of the oscillator signals. A particular example is provided in Figures 5a-5d of the application.

The type of interleavers described in both Kim and Lynch refer to block interleavers that are used to reduce the effects of burst errors in a communication system. The interleavers described in Kim and Lynch operate on the baseband symbols or bits, and do not operate to swap or exchange the routing of the signals. Indeed, in a block interleaver such as those described in Kim and Lynch, the routing of the symbols or bits are not changed, only their order. Thus, although the term "interleaver" is used in Kim and Lynch, the interleaver of the cited references is distinct from the interleaving described in Applicant's specification, and claimed in the claims.

Discussion of Allowable Subject Matter

The Examiner has objected to claims 9-11 as being dependent upon a rejected base claim, but otherwise allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicant thanks the Examiner for the indication of allowable subject matter. Applicant has amended claim 9 to include the features in base claim 1 and intervening claims 6-8. Therefore, claim 9 is believed to be in condition for allowance. Claim 10 was amended to depend from claim 9 and is believed to be allowable as depending from an allowable base claim. Applicant has canceled claim 11 without prejudice.

Discussion of New Claims

New claims 18 and 19 are directed to a method and an apparatus for quadrature balancing and Local Oscillator (LO) feedthrough suppression. Support for the claims can be found throughout the specification. In particular, support can be found at Figures 3-5 and the associated description.

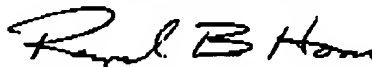
The new claims are believed to be allowable over the references cited by the Examiner, in part, because the references fail to describe selective routing of I and Q baseband signals.

CONCLUSION

In view of the foregoing, Applicant believes all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 858-350-6100.

Respectfully submitted,



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